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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to suitable storage to start the storage which used the semi-conductor flash memory, especially prolong a life.

[0002]

[Description of the Prior Art] Since it is strong to that it is a low power, and an impact and an oscillation, the storage using a semi-conductor flash memory is used instead of the magnetic disk drive as reliable storage. However, since the storage using a semi-conductor flash memory needs to add electric field strong at the time of writing and elimination to a magnetic disk drive rewriting and there being almost no limit in a count, there is a problem that the count of writing / elimination has a limit. For this reason, in order to prevent writing in only a specific field intensively, only that field's writing it in, and a count increasing as it writes in the original field again when the data of a certain memorized field in a flash memory are read, for example and modification is added to that data, the free area in a flash memory is discovered and relocation processing in which data with modification are moved and written in a free area is performed.

[0003] In case the count of elimination is calculated and recorded on JP,6-124596,A per rewriting of nonvolatile memory (it is also called an elimination unit) in the Prior art of a publication and data are rewritten, when the count of rewriting of the field which is due to rewrite data has become the regular count, drawing is about equalization of the count of elimination by searching a field with few counts of elimination, and changing assignment of the logic storing address.

[0004] Moreover, although the management address table does not prepare for JP,2000-20252,A, the rewriting frequency of each rewriting block is measured, each sector of the block judged that rewriting frequency is high is moved to another specific block, namely, the management method move a logic storing block to the physical block of an expansion field is indicated by by carrying out counting of the count of elimination of the block which stored four sector data, and recording it.

[0005]

[Problem(s) to be Solved by the Invention] when modification is added to the data which carried out reading appearance to JP,6-124596,A and JP,2000-20252,A like the conventional example of a publication, a free area can be discovered one by one, and it can cancel to some extent that write in between the fields of a flash memory and the bias of a count arises by the approach of writing in the free area, and the life of the storage which carried the flash memory can be prolonged. However, this approach is an approach of changing the field which writes in data, only when modification is added to the read data, and when not adding modification to data at all only by reading data, the count of writing of the field where that data is memorized is still 1 time written in first, and will not use all the fields of a flash memory effectively.

[0006] The 1st object of this invention is to offer the store and computer a difference can be prevented from producing to the count of writing for every block about the whole block inside the flash memory of a store.

[0007] Even if the 2nd object of this invention has access from a host at the time of the data exchange in a flash memory, it is to offer the storage and the computer which can replace a data area. [ it is satisfactory and ]

[0008]

[Means for Solving the Problem] In order to attain the 1st object of the above, the storage of this invention The address translation table the control circuit section has remembered conversion of the logical address and the physical address for every block unit of a flash memory to be, It is a thing possessing RAM in which the count table of writing which has memorized the counts of writing for every block unit including OS field was prepared. OS field block is rearranged to a free area by the read-out write request of a data area block, said data area block is written in OS field block before rewriting and relocation, and it is characterized by changing an address translation table.

[0009] Moreover, a calculating machine rearranges OS field block to a free area by the read-out write request of the data area block from a host, writes said data area block in OS field block before rewriting and relocation, and is

characterized by changing an address translation table.

[0010] In order to attain the 2nd object of the above, the store of this invention rewrites the flag condition of the exchange condition table of the block set as the object of relocation while RAM of the control circuit section is equipped with the exchange condition table and evacuation area which have memorized the status flag for every block unit further and copies OS field block to said evacuation area by the read-out write request of a data area block.

[0011] Moreover, the RAM of the control circuit section be equip with the exchange condition table and the evacuation area which have memorize the status flag for every block unit, a calculating machine rewrite the flag condition of the exchange condition table of the block set as the object of relocation while it copy OS field block to evacuation area by the read-out write request of a data area block and assign the physical address of evacuation area, and it read with reference to said flag condition at the time of access from a host.

[0012]

[Embodiment of the Invention] Hereafter, one example of this invention is explained using drawing 5 from drawing 1. Drawing 1 is the block diagram of the computing system in this example. The computing system 100 consists of storage 105 connected to the memory 103 connected with the control bridge 102 (control Bridge102) connected with CPU101 (it is also called a host 101) and CPU101, and the control bridge 102 and the interface bus 104, and the interface bus 104. As an interface with a store 105, an IDE bus, a SCSI bus, a PCI bus, an ISA Bus, etc. are used.

[0013] As shown in drawing 2, a store 105 consists of the control circuit sections 202 which are connected with the storage element 204 which performs the interface-circuitry section 201, the interface-circuitry section 201, and the data storage which exchange data with a host 101 etc., and control a storage element 204. The storage element 204 consists of flash memories.

[0014] The interface-circuitry section 201 is a circuit which controls a bus interface with a host 101, and is performing exchange of the data of PC architecture bus and the control circuit section 202, and control of timing.

[0015] RAM206 and the power off judging change circuit 205 which store the management data of the information on a storage element 204 are prepared, and it connects with the dc-battery 203 the feed side, and this power off judging change circuit 205 performs control changed to a dc-battery 203 in it, when the power source by the side of feed is judged by the control circuit section 202 to be \*\*. RAM206 consists of every rewriting unit of a storage element 204, the address translation table 207 which has memorized conversion with the logical address for every block unit, and a physical address, a count table 208 of writing which has memorized the count of writing for every rewriting unit, an exchange condition table 209, and data evacuation area 210 with the capacity for 1 block of a flash memory.

[0016] To the data writing / read-out demand from a host 101, the control circuit section 202 performs the access control to a flash memory, and is performing address translation control in the block unit in a flash memory, count control of writing, and exchange state control.

[0017] Drawing 3 is drawing having shown the approach in the block unit in the flash memory of this example to rewrite. If there are not a cure against a bug, an addition of a driver, etc. once a condition 1 writes in, it shows the data assignment in the flash memory in the condition that OS field (1) - (4) which writing does not generate, a condition log and the data area (1) where writing is usually carried out frequently, (2), and a free area without an effective data exist. For OS field, 1 and a data area (1) are [ the count of writing in a condition 1 / 8 and the free area of 10 and a data area (2) ] 0, and since rewriting is performed frequently, if the count of writing of a data area becomes the count of a write-in limitation of a flash memory, a data area (1) and (2) will become a life although this flash memory has many fields with few counts of writing.

[0018] In order to prevent this, as the data of OS field which does not have writing a limping gait crack frequently are relocated to a free area etc., and OS field before relocation is used as a data area, and the count of writing of the whole field of a flash memory is written in and it brings close to the count of a limitation, in this example, reinforcement is in drawing, using the whole flash memory effectively.

[0019] In the condition 2, when the data of a data area (1) are read and a write request occurs, it replaces by relocating the data of OS field (1) to a free area, and data are written in by making OS field before relocation (1) into a data area (1). As a result of this relocation, as shown in a condition 3, the count of writing of a data area (1) and a free area is set to 2 and 10, respectively. By repeating this processing, near of the count of writing of the whole flash memory can be carried out to the same count, and it can bring close to the count of a write-in limitation. At this time, conversion of the logical address by having rearranged and a physical address is performed, and that result is memorized to an address translation table.

[0020] Moreover, when it distinguishes whether the count which the count of writing of this block wrote in and was set up with reference to the count table is become when the data of a data area (1) are read and a write request occurs and the set-up count is become about it, you may make it rearrange. By doing in this way, the frequency of relocation decreases and a rewriting rate can be gathered.

[0021] when replacing by relocating the data of OS field (1) to a free area, and OS field carries out reading appearance from a host 101 and there is a demand, since it becomes the latency time and data-access time amount becomes long,

the time amount which rewrites the time amount and the address administration table which are written in a free area leads to lowering of system performance. In order to avoid this problem, before replacing, OS field (1) is copied to the data evacuation area 210 of RAM206 space in the control circuit section 202. When an access request is from a host 101 to OS field (1) while replacing, he is trying to read the copy data of RAM206 space of the control circuit section 202. Thus, it can prevent the access time becoming long by reading the data of RAM206.

[0022] Moreover, since RAM is volatile memory, if feed is no longer performed by the power off of a system, as for the management information in the translation table 207 of RAM206 of the control circuit section 202, the count table 208 of writing, and the exchange condition table 209, data will disappear. in order to avoid this -- the inside of the control circuit section 202 -- the power off judging change circuit 205 -- \*\*\*\*\* from a system -- \*\*\*\* -- things are distinguished, the feed to the control circuit section 202 and a flash memory is changed to a dc-battery 203, and the data in RAM206 are evacuated to a flash memory. After evacuation of the data in RAM206 is completed, since it is dc-battery power maintenance, actuation which stops the feed from a dc-battery 203 is carried out.

[0023] Drawing 4 shows the managed table of RAM206 in the control circuit section 202, and each condition of a condition 1 to the condition 3 is equivalent to each condition shown in drawing 3 . A managed table consists of an address translation table, data semantics, a count table of writing, and an exchange condition table. The logical address and a physical address are established in an address translation table, and the relation between the logical address and a physical address is matched with it. In matching with this logical address and physical address, although modification of a physical address arises by relocation of a flash memory, it has managed so that relation with the logical address controlled by OS may not be broken down. The write-in table has managed the count of writing of the write-in block unit in a flash memory. An exchange condition table is a table which has memorized the current status flag of each block, when relocation is performed, the flag of "1" is the object of relocation at the block set as the replacement object of relocation, and the flag of "0" is set for the block with which the flag of "2" is also carrying out no relocation for the block used as the object which evacuates data to RAM206 in the control circuit section 202. When there is a data transfer demand from a host 101, distinction of the data condition within a block is performed by referring to the flag of this exchange condition table. In addition, since, as for the block of "2", data transfer of the flag is carried out to the evacuation area of RAM206, as for a physical address, the address of the evacuation area of RAM206 is assigned.

[0024] Drawing 5 shows the processing flow of this example. This processing has a data write request from a host, and is carried out after termination of data write-in processing.

[0025] At step 501, it writes in with reference to the count table of writing of the block in a flash memory, and a count is checked. With this check; it writes in at step 502 and existence of the block with many counts, existence of the block currently written in more than the count to which the count of writing was set, etc. are judged, and when there is no block with many counts of writing applicable to these, processing is ended. When there is a block with many counts of writing, it writes in at step 503, and the block with few [ the minimum or ] counts is selected, and it writes in at step 504, and writes in with the block with many counts, and exchange processing with the block with few [ the minimum or ] counts is performed. Then, the block of an exchange place is copied to RAM206 at step 505, and a flag is set up to the block of a changing agency, and the block of an exchange place at step 506. Exchange processing of the block in a flash memory is carried out at step 507, an address translation table is rewritten at step 508, it changes at step 509, and a flag is cleared.

[0026] Moreover, when access is from a host to the block concerned while having evacuated to RAM206 at step 510, the evacuation processing to RAM206 is suspended at step 510, and it writes in the data concerned on a flash memory at step 511, or reads. After a host demand is completed at step 512, evacuation processing is performed to RAM206.

[0027] In addition, the managed table in RAM206 can be displayed on displays, such as a console connected to the system unit as status management data, and the demand (it is also called a bus command) from a host 101 etc. can refer it. Using this information, a user can manage life management of a flash memory, the remaining electric energy of a dc-battery, etc.

[0028] Moreover, although the example explained until now explained the method managed per block, it is applicable also to management, the access unit, for example, the sector unit, from a host.

[0029] Moreover, although this example explained the case where flash memory management information was prepared in RAM, synthetic life management of storage can be performed by preparing the register and memory which manage the resistance welding time, the count of access, the count of read/write, etc.

[0030] Since according to this example it writes in compulsorily, it writes in with little block of a count and the block with many counts is replaced even when modification is not added to data so that it may write in about the whole block inside the flash memory of a store, a count may be counted and a difference may not arise to the count of writing for every block as explained above, the life of a store can be prolonged.

[0031] Moreover, the data by which reading appearance was carried out can be written in, without producing malfunction, even if an access request is in the data to replace in case the data which do not have read-out by the check result of the count of writing are also replaced compulsorily.

[0032]

[Effect of the Invention] According to this invention, since it changes by the count of writing for every block of a flash memory, the life of storage can be prolonged. Moreover, even when reaching even the set point with the count of writing of a flash memory, replacing a data area and access to the data in the field takes place simultaneously, it is satisfactory and exchange of a data area is attained.

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[Translation done.]

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## CLAIMS

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[Claim(s)]

[Claim 1] The interface-circuitry section and the control circuit section connected with this interface-circuitry section, The address translation table with which had the flash memory connected with this control circuit section, and said control circuit section has remembered conversion of the logical address and the physical address for every block unit of said flash memory to be, It is a thing possessing RAM in which the count table of writing which has memorized the counts of writing for every block unit including OS field was prepared. Storage characterized by rearranging OS field block to a free area by the read-out write request of a data area block, writing said data area block in OS field block before rewriting and relocation, and changing an address translation table.

[Claim 2] Storage according to claim 1 which rewrites the flag condition of said exchange condition table of the block set as the object of relocation while RAM of said control circuit section is equipped with the exchange condition table and evacuation area which have memorized the status flag for every block unit further and copies said OS field block to said evacuation area by the read-out write request of said data area block.

[Claim 3] the storage according to claim 1 which performs exchange processing with the block with few [ the minimum or ] counts of writing when distinguished more than from the count to which the count of writing of said data area block which the data area block carried out reading appearance of said control circuit section, and was memorized by the write request by said count table of writing was set.

[Claim 4] The interface bus and memory which were connected to the host, this host, and the control bridge by minding, The interface-circuitry section connected with this interface bus, and the control circuit section connected with this interface-circuitry section, The address translation table with which had the flash memory connected with this control circuit section, and said control circuit section has remembered conversion of the logical address and the physical address for every block unit of said flash memory to be, It is a thing possessing RAM in which the count table of writing which has memorized the counts of writing for every block unit including OS field was prepared. The computer characterized by rearranging OS field block to a free area by the read-out write request of the data area block from said host, writing said data area block in OS field block before rewriting and relocation, and changing an address translation table.

[Claim 5] The RAM of said control circuit section is the computer according to claim 4 which is equip with the exchange condition table and the evacuation area which have memorize the status flag for every block unit , rewrites the flag condition of said exchange condition table of the block set as the object of relocation while copy said OS field block to said evacuation area by the read-out write request of said data area block and assign the physical address of evacuation area , and reads with reference to said flag condition at the time of access from said host .

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